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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/562,970	12/29/2005	Sozaburo Ohashi	126491	7899

25944 7590 01/19/2007

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EXAMINER	
RUTHKOSKY, MARK	
ART UNIT	**PAPER NUMBER**
1745	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/19/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/562,970	OHASHI, SOZABURO	
	Examiner	Art Unit	
	Mark Ruthkosky	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 October 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *See Continuation Sheet*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :12/29/2005, 3/17/2006, 10/6/2006.

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

The drawings filed on 12/29/2005 have been approved.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 2 states "the weight ratio of ion exchange resin and carbon carrier." There is insufficient antecedent basis for this limitation in the claim or in claim 1 from which it depends.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 5 and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Imahashi et al (US 5,350,643.)

The instant claims are to a fuel cell having at least a membrane electrode assembly comprising an electrolyte membrane, a hydrogen electrode-side catalyst layer formed on one side thereof, and an air electrode-side catalyst layer formed on the other side thereof, in which the porosity of the hydrogen electrode-side catalyst layer is made to be lower than that of the air electrode-side catalyst layer.

Imahashi et al (US 5,350,643) teaches a fuel cell having at least a membrane electrode assembly comprising an electrolyte membrane, a hydrogen electrode-side catalyst layer formed on one side thereof, and an air electrode-side catalyst layer formed on the other side thereof, in which the porosity of the hydrogen electrode-side catalyst layer is made to be lower than that of the air electrode-side catalyst layer (claims 1-11, col. 4, line 61 to col. 6, line 54, example 1.) With regard to claim 5, example three discloses using materials having smaller particle sizes for the hydrogen catalyst electrode relative to the oxygen catalyst electrode in order to prepare a hydrogen catalyst electrode having a lower porosity (also see col. 5, lines 1-12.) With regard to claim 8, MPEP 2113 states, "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of

a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." The porosity of the hydrogen electrode-side catalyst layer is lower than that of the air electrode-side catalyst layer. Thus, the claims are anticipated.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3, 4, 6, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imahashi et al (US 5,350,643), as applied to claims 1-2, 5 and 8.

Imahashi et al (US 5,350,643) teaches a fuel cell having at least a membrane electrode assembly comprising an electrolyte membrane, a hydrogen electrode-side catalyst layer formed on one side thereof, and an air electrode-side catalyst layer formed on the other side thereof, in which the porosity of the hydrogen electrode-side catalyst layer is made to be lower than that of the air electrode-side catalyst layer (claims 1-11, col. 4, line 61 to col. 6, line 54, example 1.) The electrodes include ion-exchange materials to transfer charged ions and water, catalyst for catalyzing the fuel cell reactions that produce electricity, binder for holding the electrode together and a conductive carbon carrier for transferring the electricity. The reference establishes that the conductive carbon carrier increases electrical conductivity, but reduces ionic

conductivity in the electrode, while the ion exchange resin increases ionic conductivity, but reduces electrical conductivity (see cols. 5-6 and examples 1-3.)

With regard to claim 3, the reference does not teach the weight ratio of ion-exchange resin to carbon carriers of the hydrogen electrode-side catalyst layer is greater than or equal to 1.5:1 and less than 3.0:1 and the weight ratio of ion-exchange resin to carbon carriers of the air electrode-side catalyst layer is greater than or equal to 0.4:1 and less than 1.5:1. The reference does not provide a specific weight for the carbon carriers. The reference does state in example 1 that the amount of ion-exchange material is 30 wt. % and the amount of PTFE is 30% in the hydrogen electrode, while the amount of ion-exchange material is 20 wt. % and the amount of PTFE is 20% in the oxygen electrode. It is clear that the ratio is higher in the hydrogen electrode than in the air electrode. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a weight ratio of ion-exchange resin to carbon carriers of the hydrogen electrode-side catalyst layer is greater than or equal to 1.5:1 and less than 3.0:1 and the weight ratio of ion-exchange resin to carbon carriers of the air electrode-side catalyst layer is greater than or equal to 0.4:1 and less than 1.5:1 in order to give an electrode having an increased porosity on the oxygen electrode. The reference teaches that the hydrogen diffusion into and through the electrode is high due to the smaller size of hydrogen (col. 6, lines 6-54) that the diffusion and reactivity of oxygen is relatively low due to the larger relative size of oxygen, and that increasing the pore size allows for improved diffusion and reactivity. Further, water management in the electrode is taught such that increasing the amount of the ion-conductor or porosity will improve the flow of water from the oxygen electrode to the electrolyte membrane (see col. 6, lines 6-54 and col. 5, lines 9-50.) The invention prevents water from clogging the

pores. Thus, the prior art recognizes the advantages of increasing the amount of ion-exchange resin improving water flow and lowering porosity, as well as the limitations of increased porosity (such as increased resistivity due to lesser amounts of conductive material.) From this, the skilled artesian have the knowledge to adjust the relative amount of each material in order to obtain the desired results.

Further, the reference does not teach the volume of pore space of the hydrogen electrode-side catalyst layer accounts for 1.0% to 3.0% of the total volume of the catalyst layer and the volume of pore space of the air electrode-side catalyst layer accounts for 3% to 30% of the total volume of the catalyst layer. The reference teaches that the pore space of the hydrogen electrode is lower than that of the oxygen electrode (see col. 4, lines 30-40 and col. 6.) It would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the volume of pore space of the hydrogen electrode-side catalyst layer to account for 1.0% to 3.0% of the total volume of the catalyst layer and the volume of pore space of the air electrode-side catalyst layer to account for 3% to 30% of the total volume of the catalyst layer, as the pore space of the hydrogen electrode is well described in the reference as lower than that of the oxygen electrode. The prior art teaches the advantages and disadvantages of increasing/decreasing the pore space in the electrode as noted in the previous section. The reference teaches that the hydrogen diffusion into and through the electrode is high due to the smaller size of hydrogen (col. 6, lines 6-54.) Relatively lower porosity is therefore sufficient in the hydrogen electrode. The diffusion and reactivity of oxygen is relatively low so increased pore size allows for improved diffusion and reactivity. Thus, the prior art recognizes the advantages of lower porosity in the hydrogen electrode and higher relative porosity in the oxygen electrode including good diffusion/reactivity,

and increased conductivity due to more conductive material. From this the skilled artesian have the knowledge to adjust the relative amount of porosity in order to obtain the desired results such as hydrogen and oxygen reactivity at the catalyst electrodes, electron conductivity through the fuel cell, ionic transfer between the electrodes and the electrolyte, and water management of the electrode/electrolyte assembly.

Further, the reference does not teach the average particle diameter of the additive is less than or equal to 0.3 μm. Example three discloses using materials having smaller particle sizes in the hydrogen catalyst electrode relative to the oxygen catalyst electrode in order to prepare a hydrogen catalyst electrode having a relatively lower porosity. The reference also teaches that adjustment of porosity can be achieved by changing particle sizes of the electrode material and the amount of the material (see col. 5, lines 1-12.) It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a particle size having average particle diameter of less than or equal to 0.3 μm in order to reduce the porosity of the hydrogen electrode so the flow of hydrogen is sufficient for reactivity at the negative electrode and the electrical conductivity of the electrode is improved due to greater amounts of carbon carrier. The prior art recognizes the advantages of smaller sized materials in the hydrogen electrode for good diffusion/reactivity, and increased conductivity due to more conductive material. From this, the skilled artesian has the knowledge to adjust the relative material size in order to obtain the desired results. The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Examiner Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 571-272-1291. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:30.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free.)

Mark Ruthkosky
Primary Patent Examiner
Art Unit 1745

Mark Ruthkosky
12.19.2006